NACT 287 – Dry Cleaning

National Training Program

History of DC Solvents

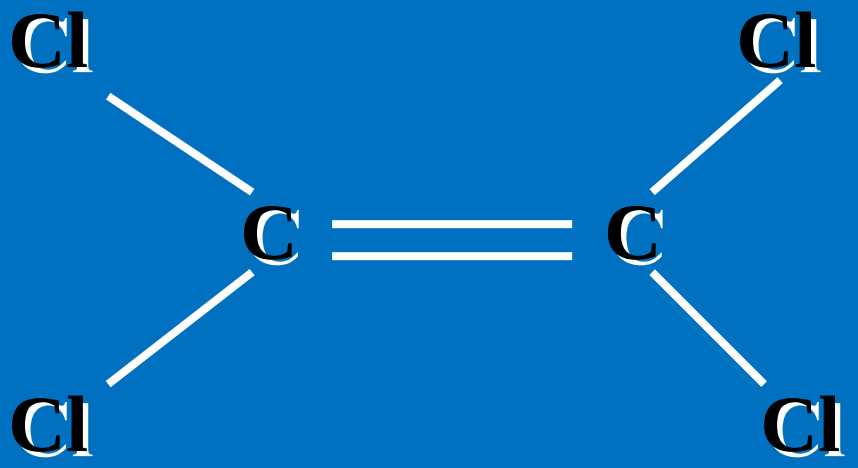
- Petroleum Solvents
  - 140°F Solvent
  - Stoddard
  - DF 2000
- TCE & Carbon Tet
- PERC
- TCA,CFC-113, HCFC's
- New Solvents

Physical Properties

Solvent	Molecular Weight	Boiling Point (F)	Flash Point (F)	Latent Heat of Vaporization	Kauri-butanol Value
PERC	165.8	250	***	90	92
Stoddard	140-150	310	103	118	28-45
CFC-113	187.5	118	***	63	31
1-1-1, Trich.	***	165	***	104	124
DF-2000	140	***	147	***	27

PERC Properties

- Physical
- Chemical



Tetrachloroethylene

Large Spills: Contain - pr[illegible]s. U[illegible]ent (soil, sand or other inert material). Collect and se[illegible]al. [illegible]ion of sewers or waterways has occurred advise the local emergency services.

7. HANDLING AND STORAGE

Storage: Store in a cool place and out of direct sunlight. Store away from sources of heat or ignition. Store away from foodstuffs. Keep containers closed at all times - check regularly for leaks.
Containers should be of mild steel, or amber or dark green solvent resistant plastic or glass. Bulk storage vessels should be made of steel and require a suitable vent or pressure relief valve. Storage tanks should be bunded to accomodate 110%of the tank volume (1).

This material is a Scheduled Poison S6 and must be stored, maintained and used in accordance with the relevant regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National occupational exposure limits

TWA		STEL		Carcin-ogen Category	Notices
50 ppm	340 mg/m3	150 ppm	1,020 mg/m3	3	

As published by National Occupational Health and Safety Commission (Worksafe Australia).

Exposure Standard (TWA) is the time-weighted average airborne concentration over an eight-hour working day, for afive-day working week over an entire working life. According to current knowledge this concentration should neither impair the health or, not cause undue discomfort to, nearly all workers.

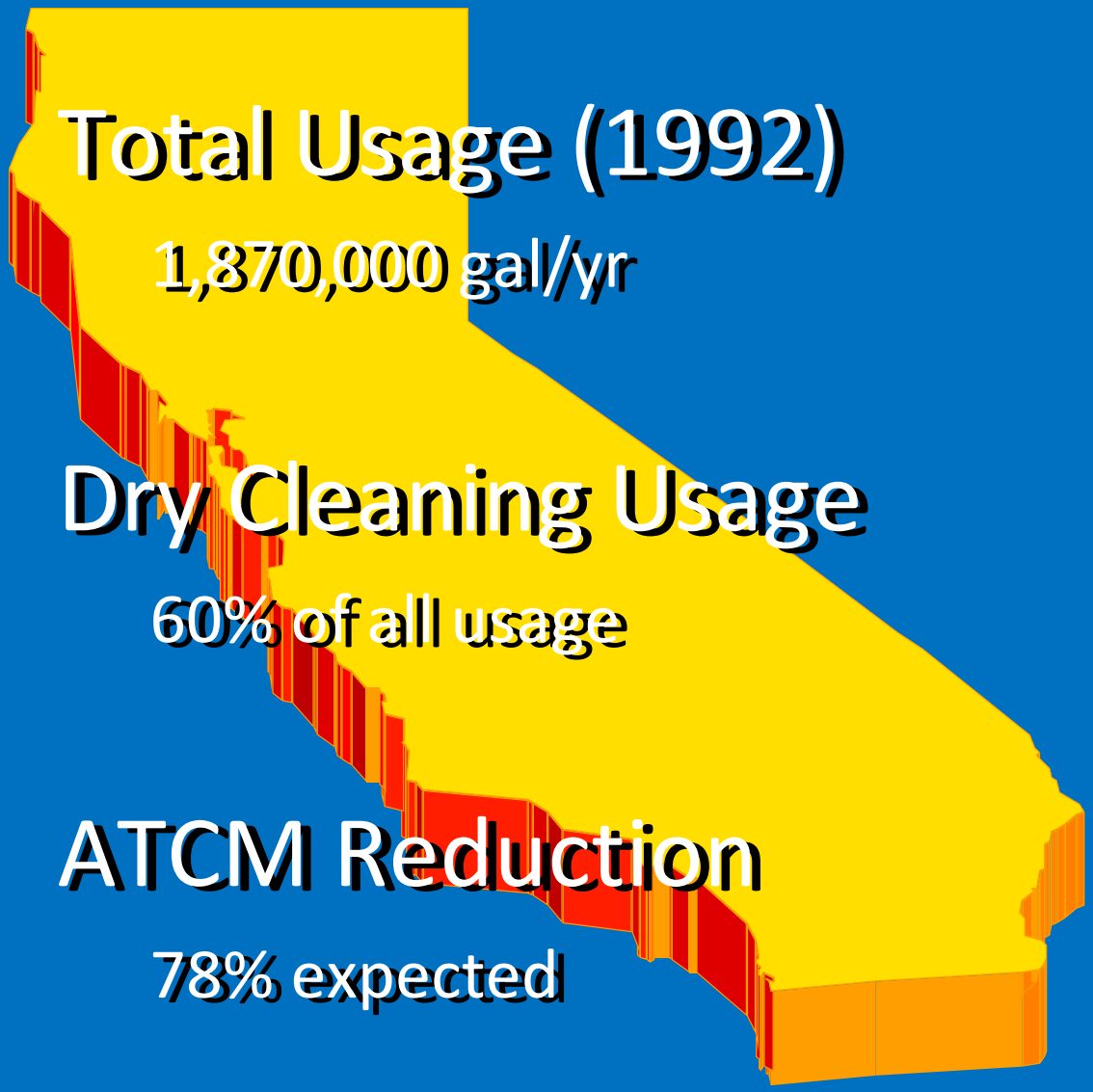
STEL (Short Term Exposure Limit) - the average airborne concentration over a 15 minute period which should not beexceeded at any time during a normal eight-hour work day.

Carcinogen Category 3 - substances suspected of having carcinogenic potential. The available information is not adequate for making a satisfactory assessment.

These Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These Exposure Standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Engineering measures: Ensure ventilation is adequate to maintain air concentrations below Exposure Standards. Use with local exhaust ventilation or while wearing organic vapour respirator or air supplied mask. Vapour heavier than air - prevent concentration in hollows or sumps. DO NOT enter confined spaces where vapour may have collected. Avoid contact with naked flames and hot surfaces as toxic decomposition products can be formed. Do not weld in the presence of vapours as toxic decomposition products may be formed (1). not in use.

PERC Usage In California



Total Usage (1992)

1,870,000 gal/yr

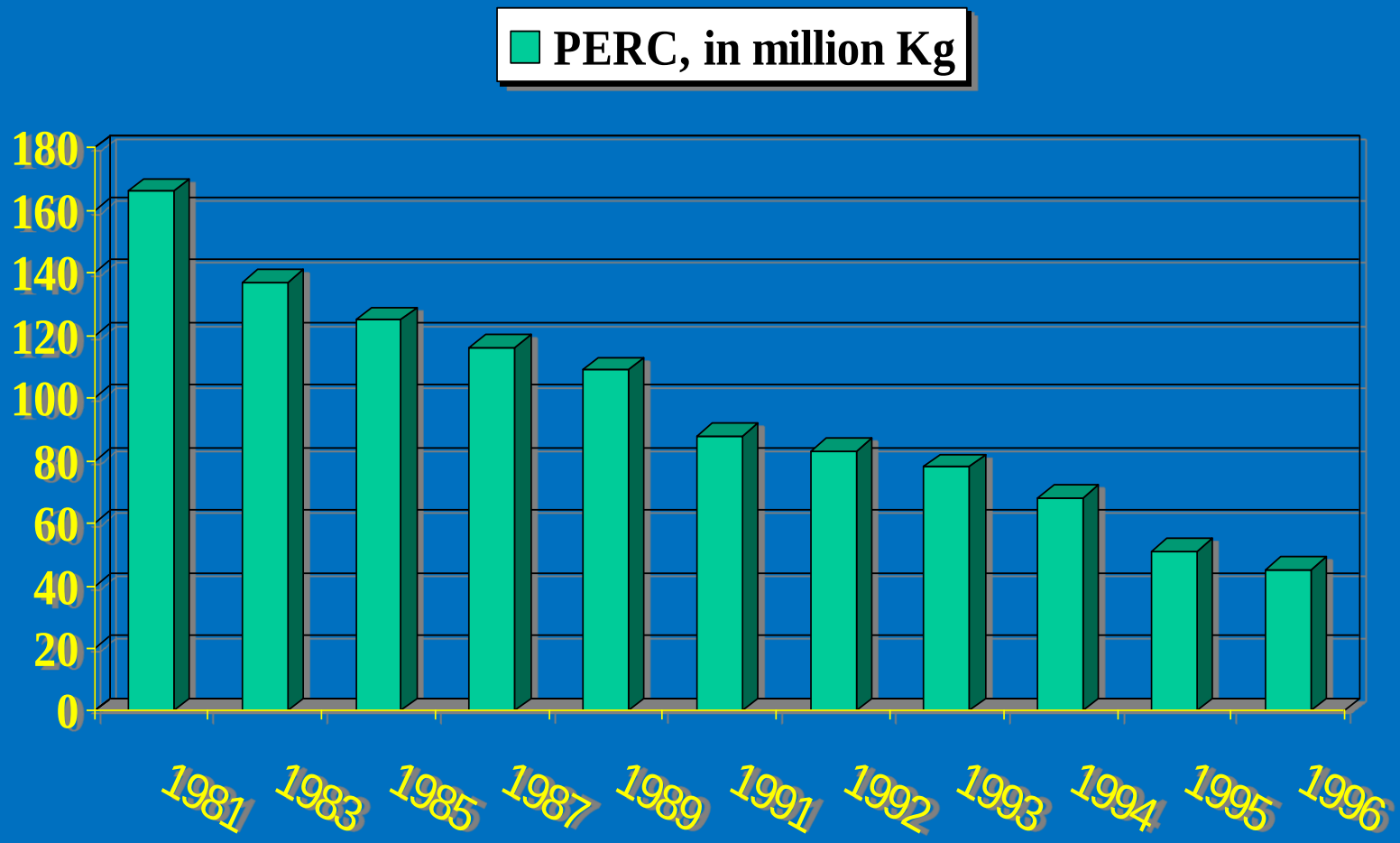
Dry Cleaning Usage

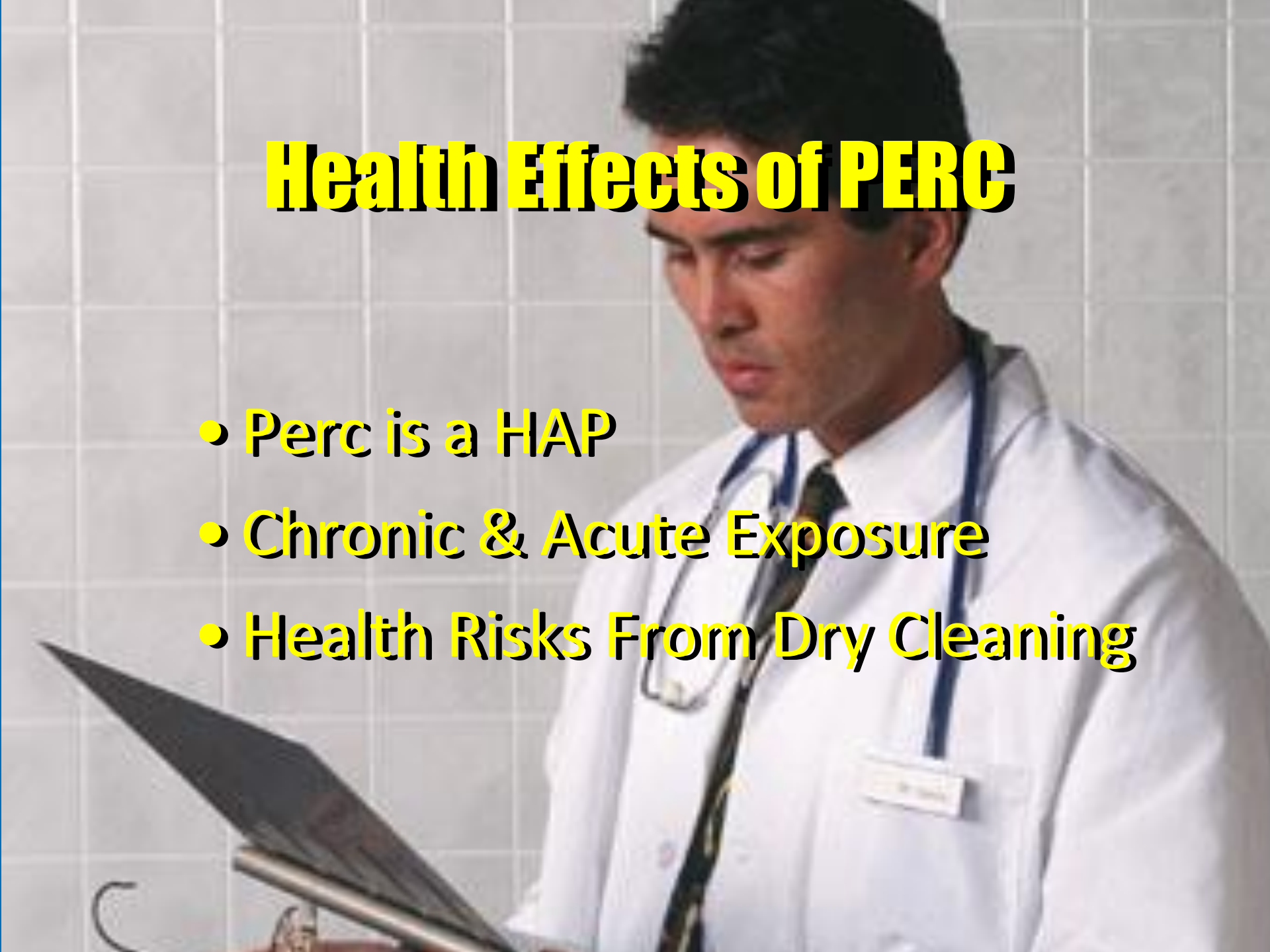
60% of all usage

ATCM Reduction

78% expected

PERC Usage In California





Health Effects of PERC

- Perc is a HAP
- Chronic & Acute Exposure
- Health Risks From Dry Cleaning

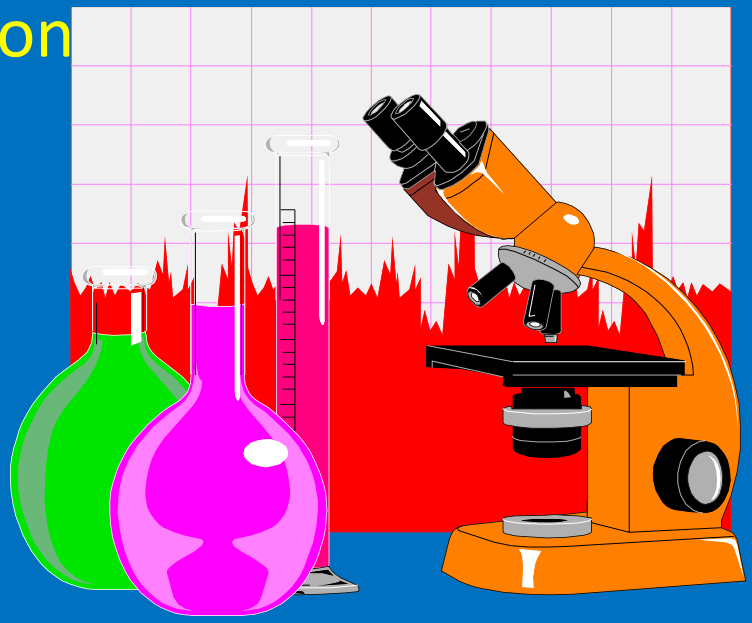
What is a TAC?

"An air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness"

HSC 39655 (a)

Air Toxics Program History

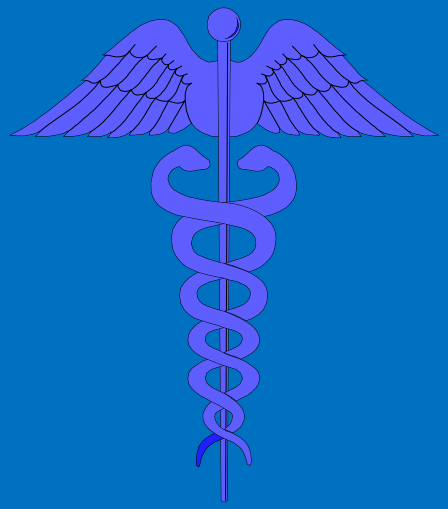
- PERC Identified Through A Formal Public Process in 1993
  - OEHHA Evaluation
  - ARB Evaluation
- HAP Listing



PERC Exposure Thresholds

Type of Limit	(ppm)
State OSHA PEL	25
Federal OSHA PEL	100
Federal OSHA Ceiling	200
State OSHA Ceiling	300
Federal OSHA Peak	“

Potential Health Effects From PERC Dry Cleaning



- Health Risks
- Individual Cancer Risk
- Non-Cancer Risk
- Non-Cancer Health Effects

The Dry Cleaning Process

- Wash Cycle
- Extraction Cycle
- Drying Cycle
- Cool Down Cycle

Dry Cleaning Equipment and Operations

- Types Of Dry Cleaning Machines
- Machine Requirements Of MACT
- Major Dry Cleaning Components
- Primary, Secondary, and Fugitive Controls

Equipment Evolution

- Machine Generations:

  1st -Transfer Machines

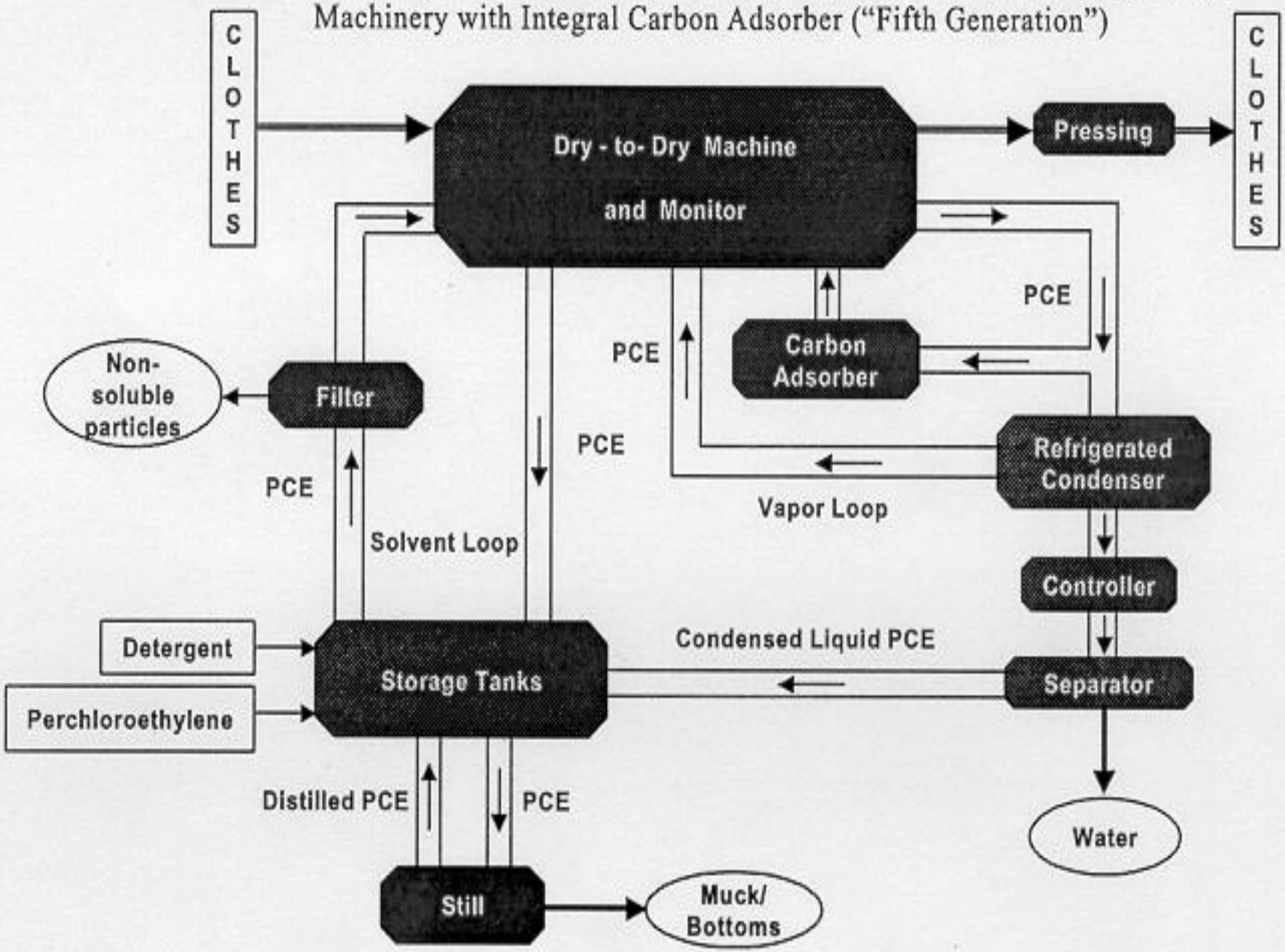
  2nd- Dry-To-Dry Vented

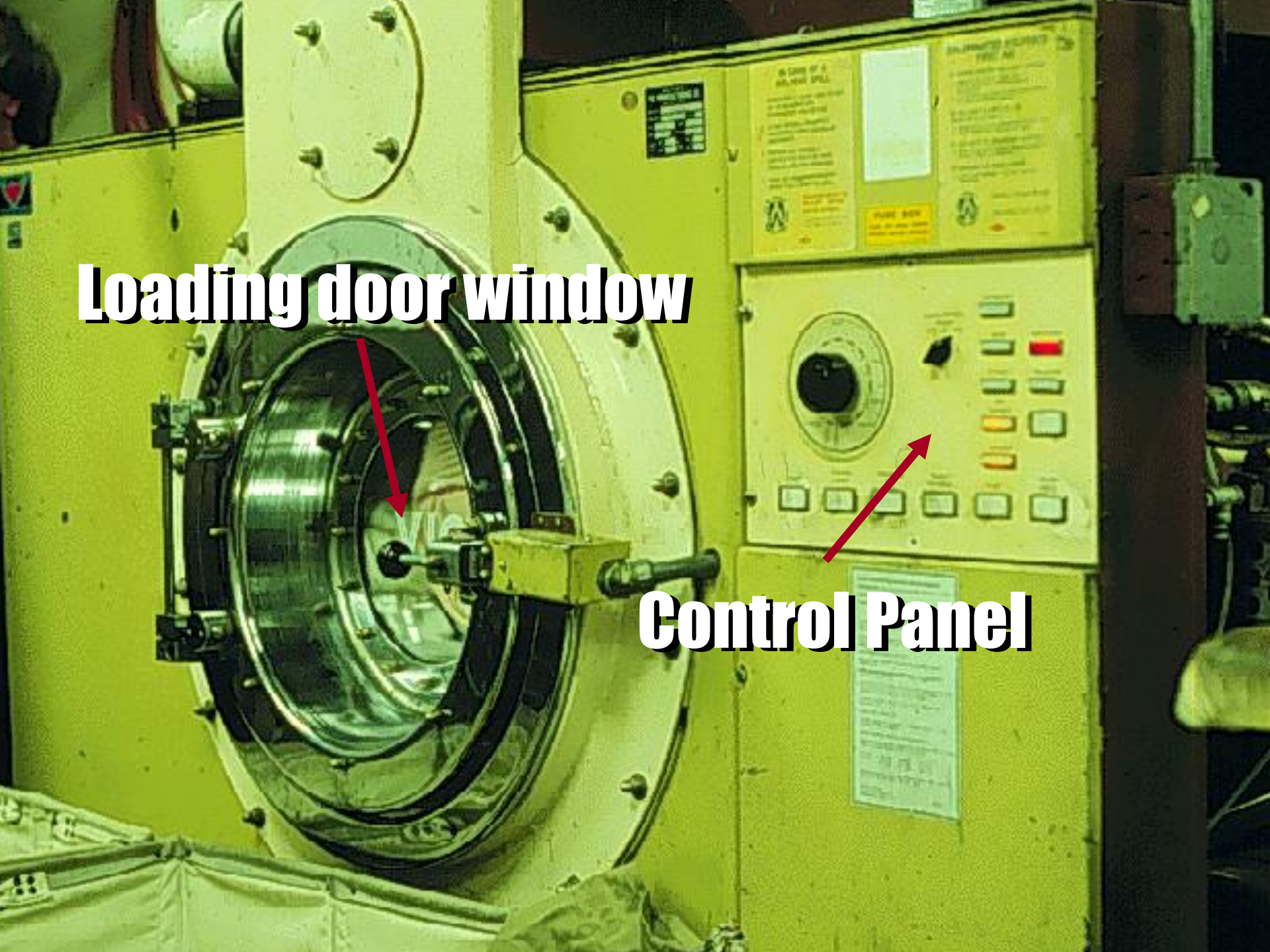
  3rd- Dry-To-Dry Nonvented

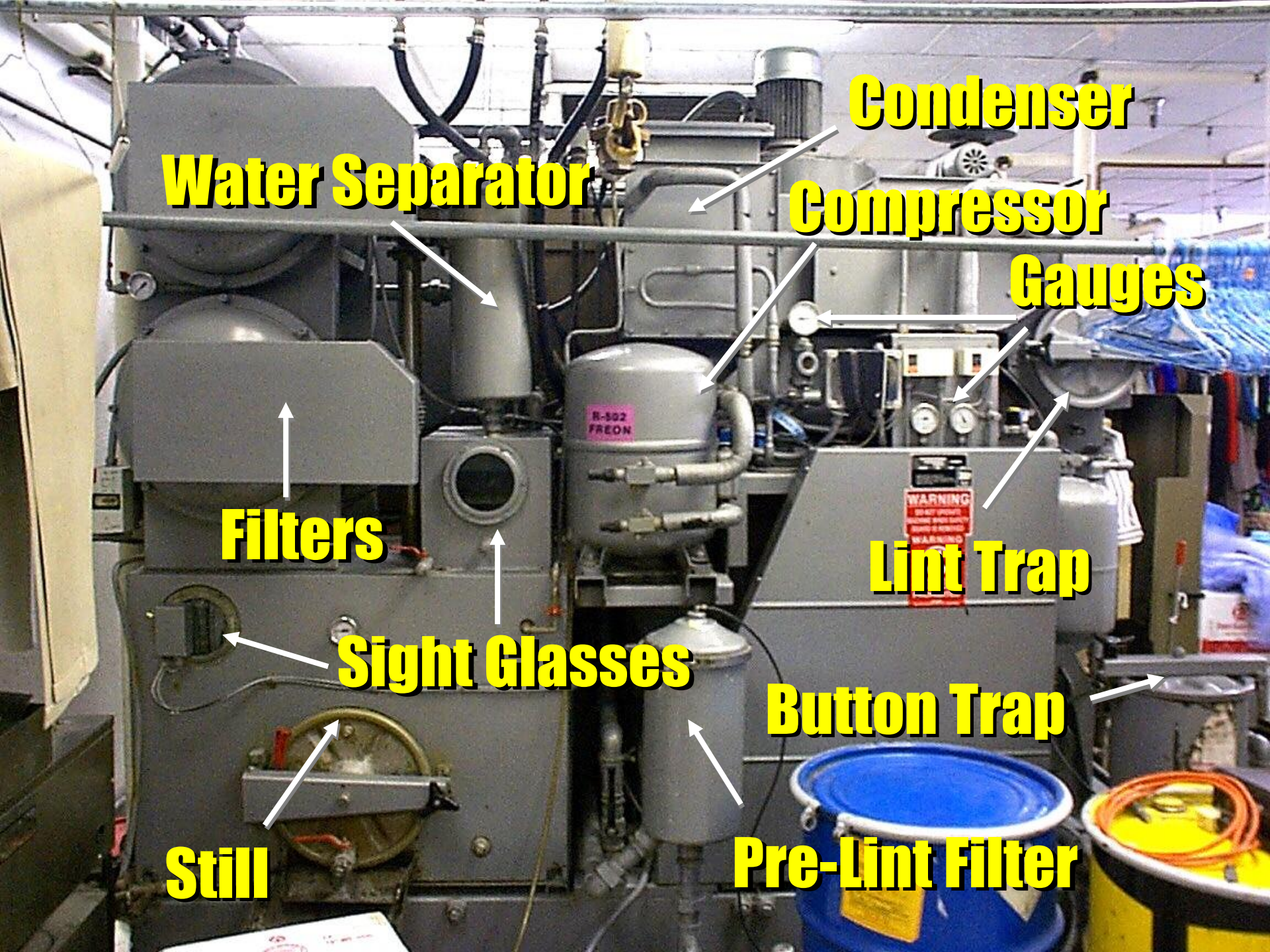
  4th- Refrigerated and Carbon Adsorber

  5th- Secondary Control w/Drum Monitor

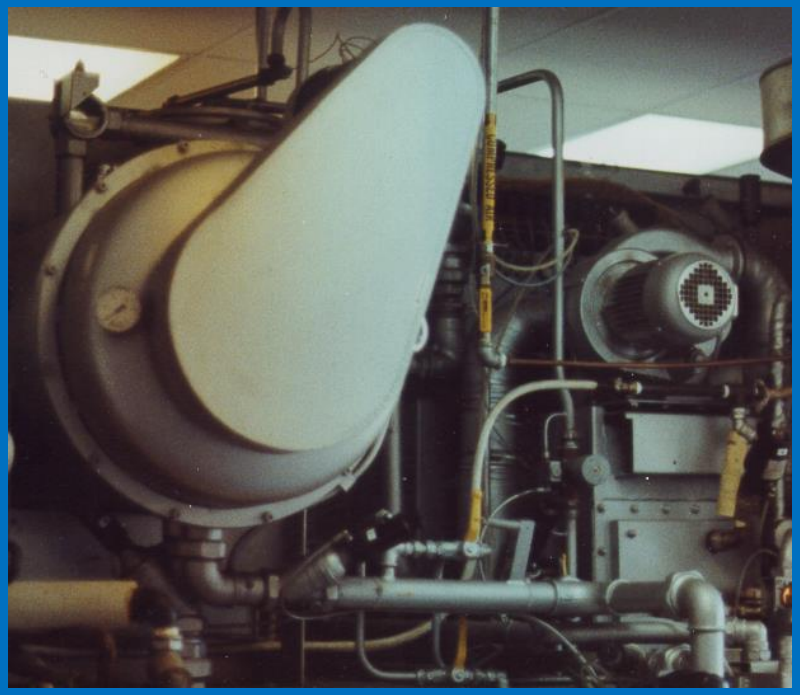
EXHIBIT 1: Simplified Process Flow Diagram for PCE Dry-to-Dry Closed Loop Machinery with Integral Carbon Adsorber ("Fifth Generation")

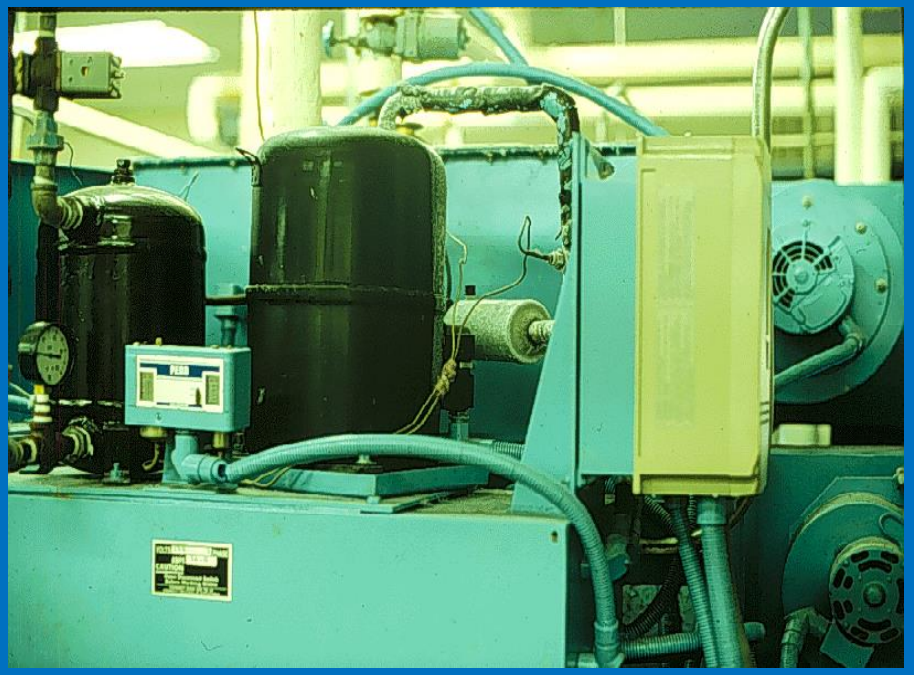



Loading door window
Control Panel

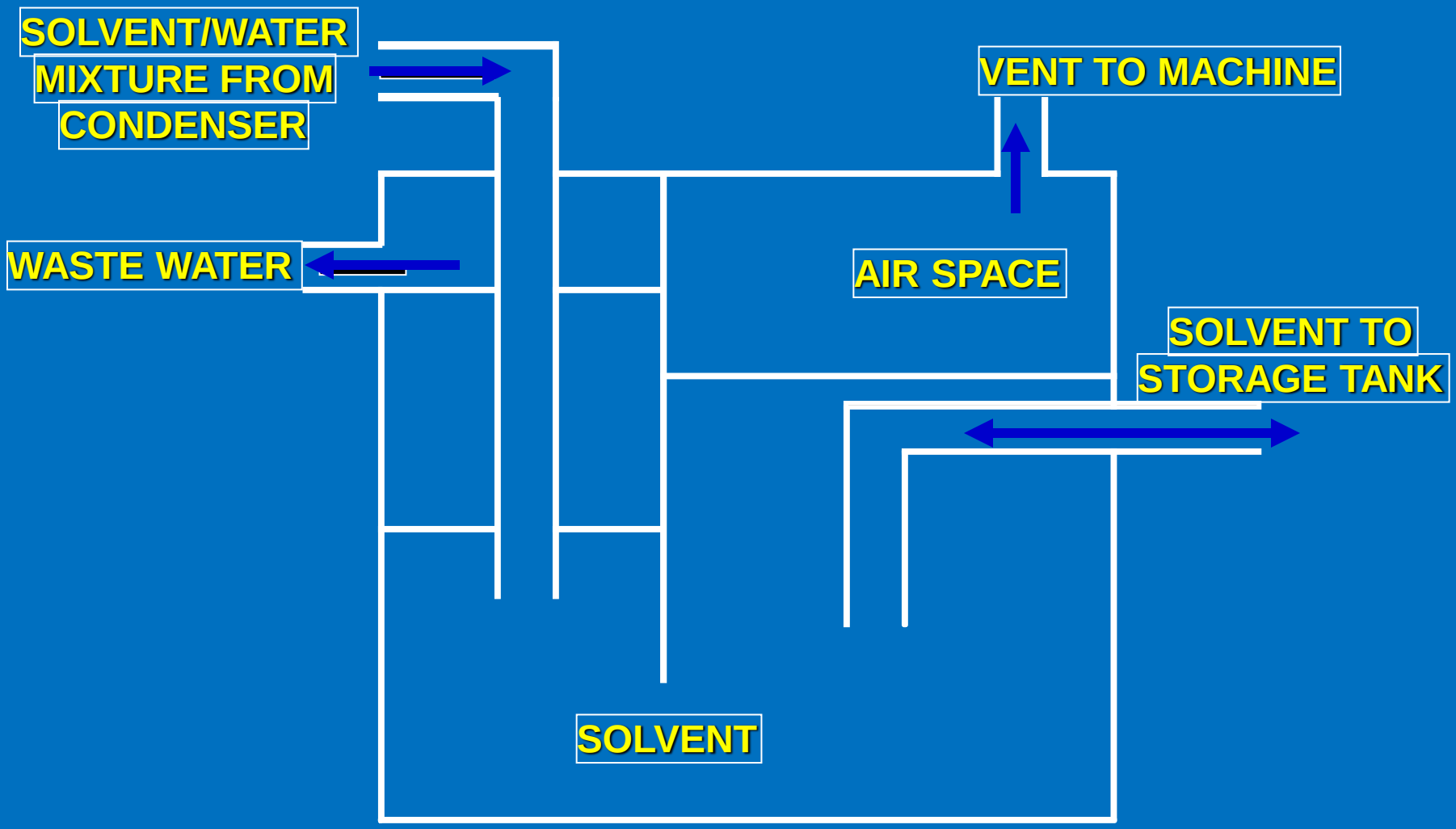

Condenser
Water Separator
Compressor
Gauges
Filters
Lint Trap
Sight Glasses
Button Trap
Still
Pre-Lint Filter

Refrigerated Condensers





Water Separators

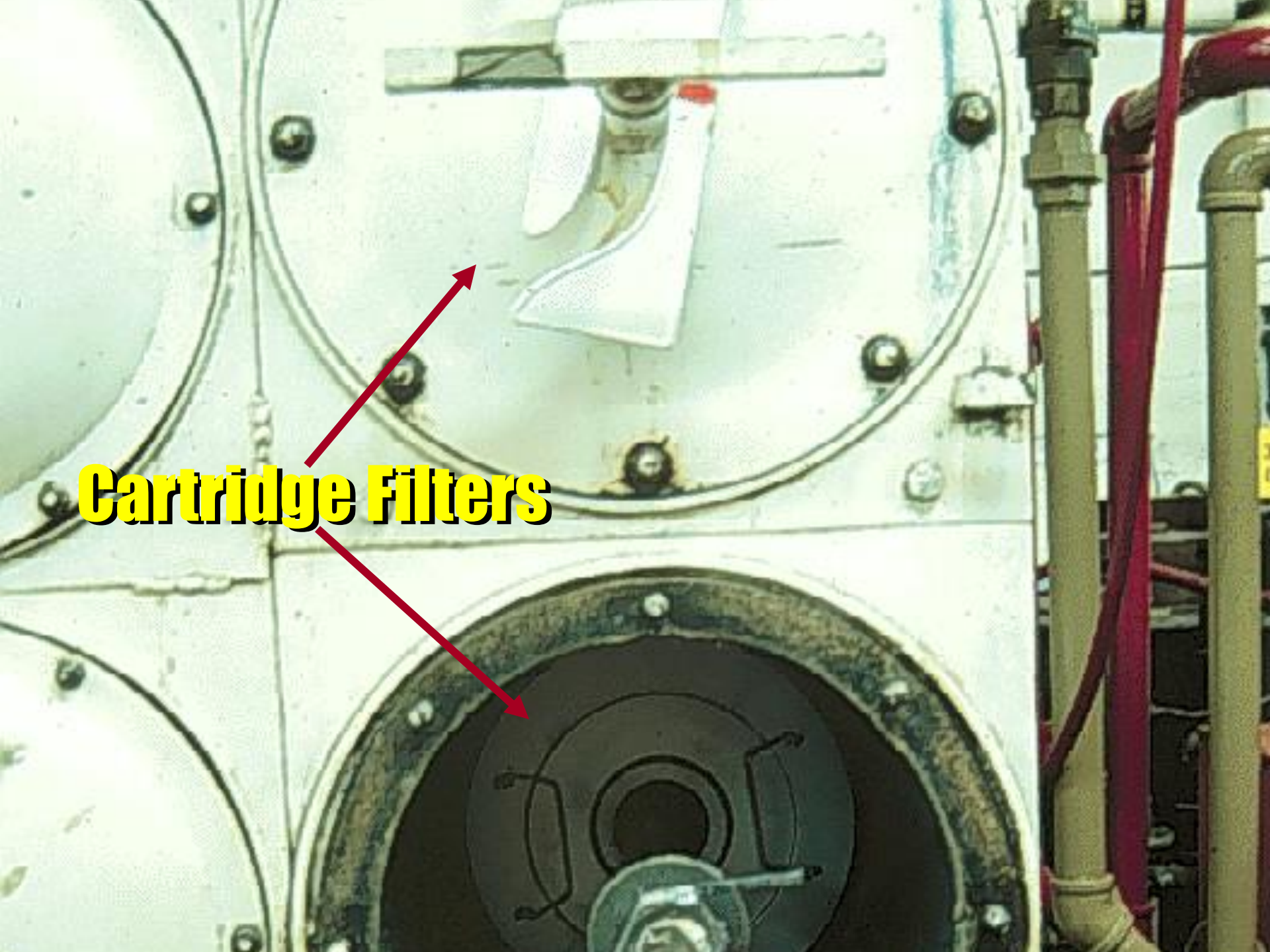


Water Separators

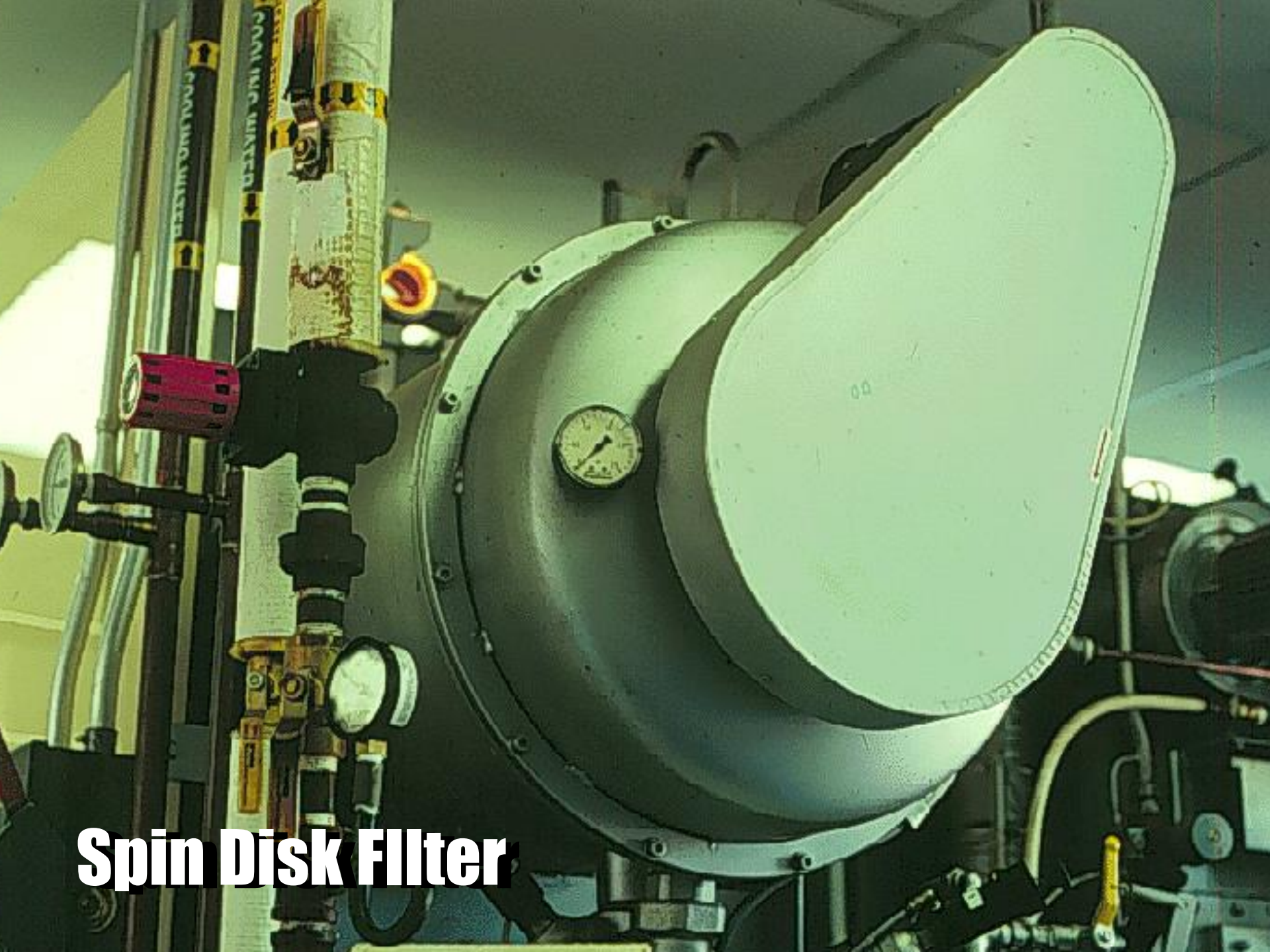
Solvent Filtration

- Purpose
- Pre Filters
- Cartridge Filtration
- Disk Filtration
- Regenerative or Flex-Tube Filters

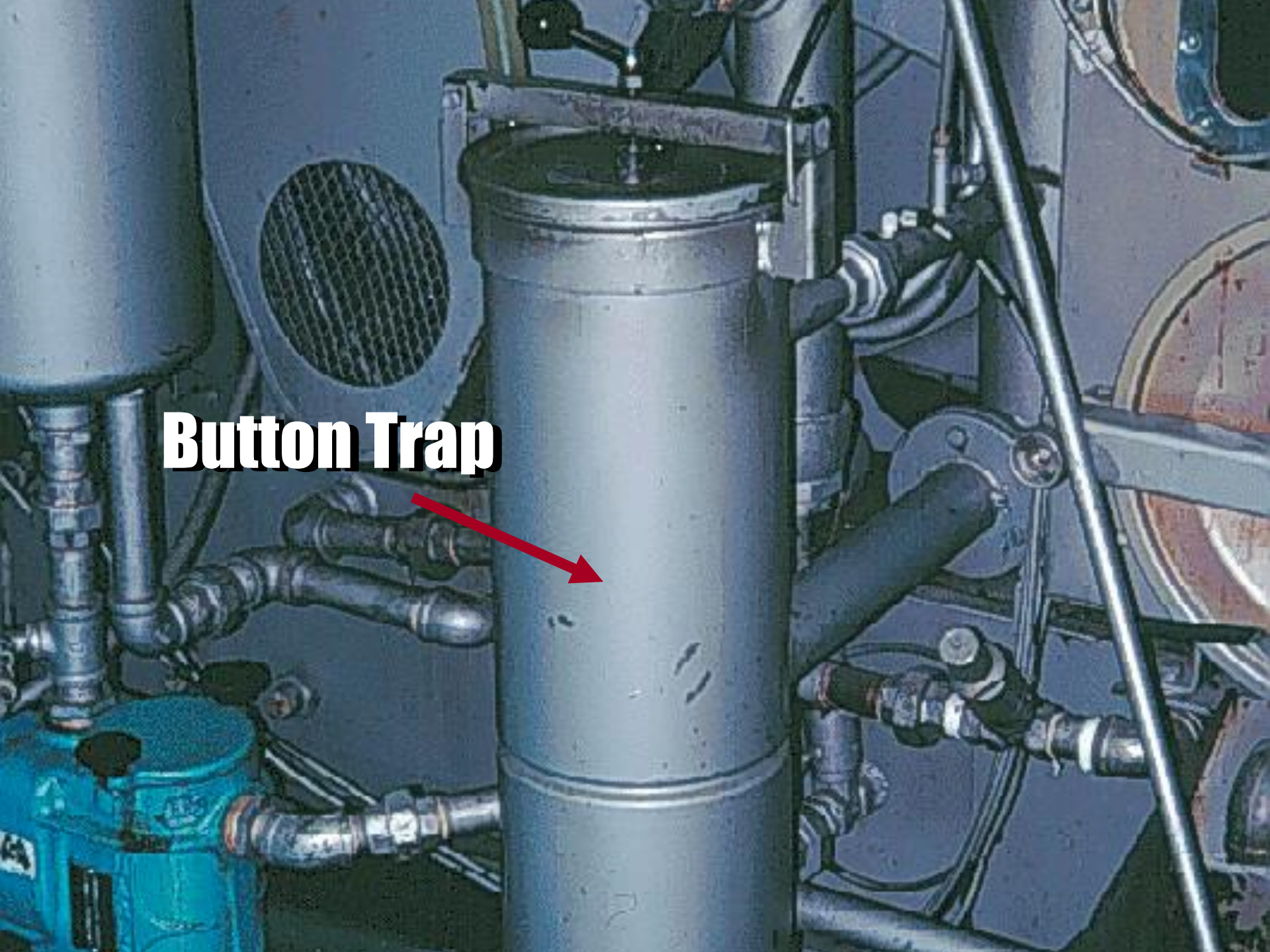

Pre-lint filter


Cartridge Filters


Torpedos
PURITAN

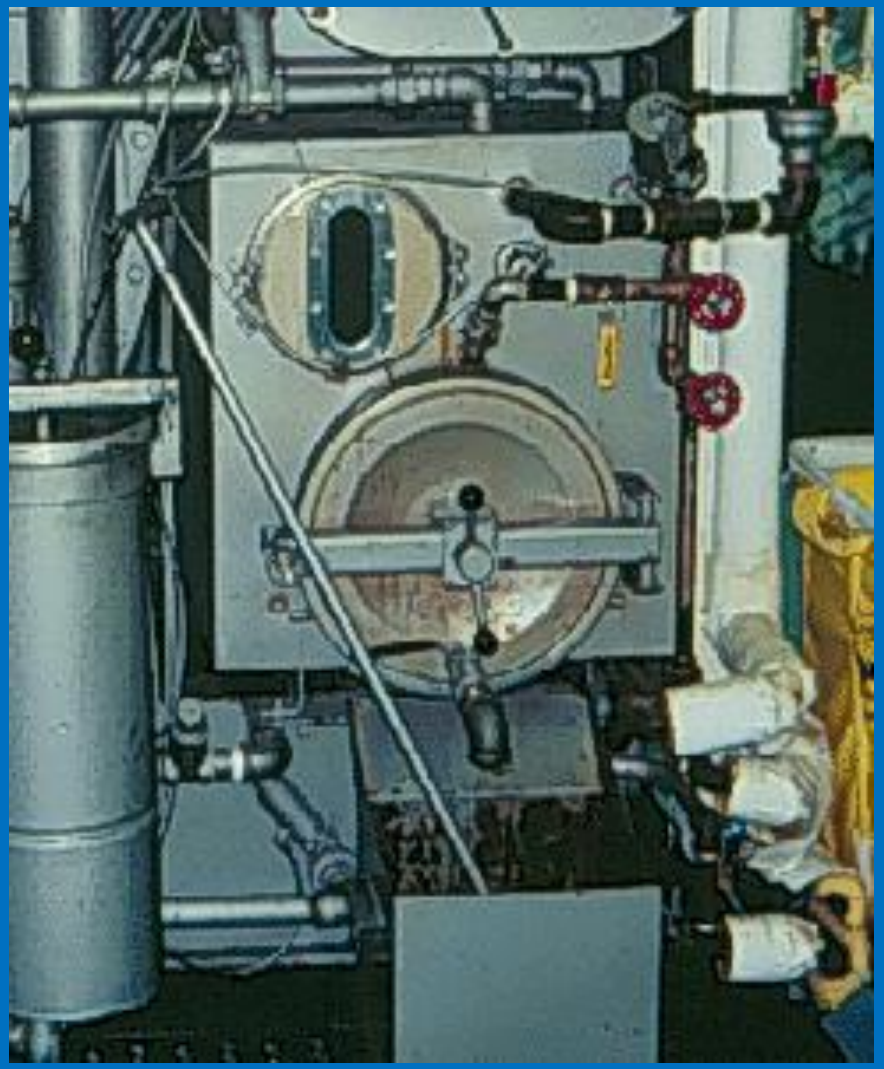

Spin Disk Filter

Button Traps


Button Trap

Stills

- Distillation
- PERC Recovery
- Muck Cookers
- Hazardous waste
- Azeotrope




Common
Leak
Points

Secondary Control Devices

- Vapor Adsorbers
- During End Of Cool Down Cycle
- Decreases Emissions
- Lowers Operator Exposure

Misc. Equipment & Operations

- Water Separators
- Inductive Door Fans
- Spill Containment Systems
- Ventilation/Exhaust Systems
- Drying Cabinet
- Water Repelling Operations


Floor to Ceiling Around Machine
MIDWEST


Vapor Barrier Curtain


Air Mover

Waste Water Treatment Units

- What are They?
- Why Use One?
- How Do They Work?
- What Types Are There?

Emissions From Dry Cleaners

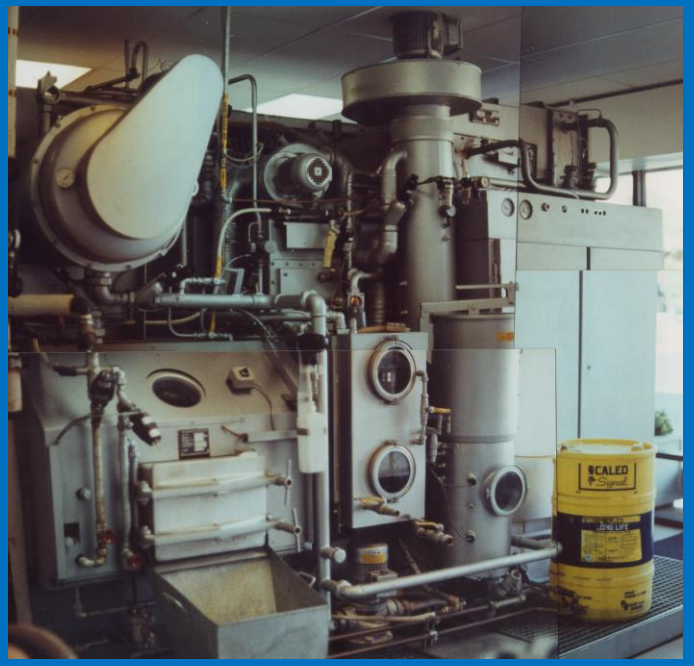
- Door Fan Emissions
- Fugitive Emissions

Federal Air Regulations

- National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities 40 CFR 63 Subpart M
- Standards of Performance for Petroleum Drycleaners 40 CFR 60 Subpart JJJ

40 CFR 63 Subpart M
Dry Cleaning MACT

- Applicability
- Standards
- Monitoring
- Reporting
- Recordkeeping



Applicability

- Dry Cleaning systems using PERC
- Many construction, reconstruction and installation dates in regulation but only a few matter

Applicability Dates

- Transfer machines banned as of July 28, 2008
- Small area source dry to dry installed prior to or after 12/9/91 have different control requirements (i.e. pollution prevention activities)
- All other sources should already be in compliance with regulation

Applicability
Source Classification

Classification	Perc purchases (gallon/year)
Small Area	Less than 140
Large Area	140-2100
Major	Greater than 2100

Annual Perc purchases calculated on a 12 month rolling total

Applicability

- Comply with new requirements within 180 days of moving up in classification
- Coin-ops exempt
- Area sources not subject to Title V unless major for something else

Standards
All Source Classifications

- Dry to dry installed after 9/22/93 need refrigerated condenser. Major sources also need carbon adsorber.
- Dry to dry installed between 12/9/91 and 9/22/93 need refrigerated condenser or carbon adsorber.
- Small area dry to dry installed prior to 12/9/91 need NO additional control

Standards
All Source Classifications

- Close door immediately after transferring articles and keep closed at all other times
- Maintain equipment according to manufacturers specs and recommendations
- Drain all cartridge filters in sealed container for 24 hours or equiv. before removing from facility

Standards
All Source Classifications

- Store all PCE and PCE wastes in containers with no perceptible leaks

Standards
All Source Classifications

- Weekly (biweekly for small area) inspection for perceptible leaks while operating for: hose and pipe connections and valves, door gaskets, filter gaskets, pumps, solvent tanks and containers, water separators, muck cookers, stills, exhaust dampers, diverter valves, filter housings

Standards
All Source Classifications

- Monthly vapor leak monitoring for all components while operating.
- Area sources may use halogenated hydrocarbon detector or PCE gas analyzer.
- Majors must use PCE gas analyzer and EPA Method 21.

Standards
All Source Classifications

- Repair all perceptible or monitored leaks within 24 hours of detection.
- If repair parts need to be ordered, order within 2 working days and install within 5 working days of receipt

Standards
All Source Classifications

- Perceptible Leak – Leak detected by odor, sight, or feel.
- Monitored Leak – Instrument that alarms or shows perc values of 25ppm

Standards
Major Sources

- Pass perc vapor from inside machine through a carbon adsorber immediately before or as the door of the machine is opened

Standards
Refrigerated Condensers

- Operate to not vent perc vapor stream to atmosphere while drum is rotating
- Prevent air drawn into machine when door is open from passing through condenser

Standards
Refrigerated Condensers

- Monitor weekly at outlet side of condenser before end of cool-down or drying cycle with temperature sensor to determine if temp is equal or less than 45 degree F.
- Can also monitor pressures of refrigeration system

Standards
Carbon Adsorbers

- Operate to not vent perc vapor stream to atmosphere at any time
- Weekly monitoring with colorimetric detector tube or PCE gas analyzer
- For 91-93 machines and adsorbers used immediately upon opening of doors, limit is 100 ppm at adsorber outlet

Standards
Carbon Adsorbers

- For machines that pass vapor through adsorber prior to opening door, limit is 300 ppm at a location above clothes at the rear of the drum immediately upon opening door.

Standards
Control Equipment Repairs

- For monitored parameters not meeting limits, adjustments or repairs shall be made to meet limits
- If repair parts are needed, they must be ordered within 2 working days and installed within 5 working days of receipt.

Standards
Co-Location with Residential

- Residential means dwellings other than short term such as hotels, whether occupied or not
- Systems installed after 12/21/2005 cannot use perc after 07/27/2009
- All other perc systems must be removed by 12/21/2020

Reporting

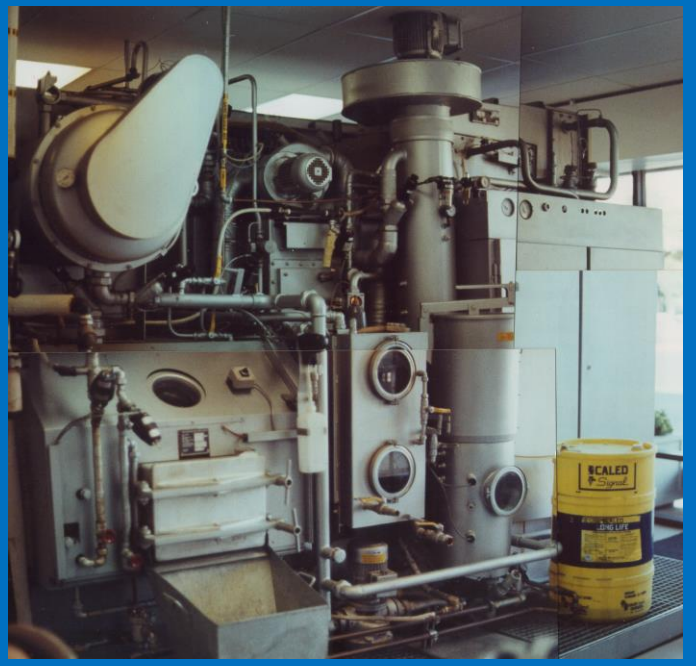
- Initial Notification report
- Notification of compliance status
- Notice of exceeding consumption limit

Recordkeeping

- Perc purchases and 12 month rolling total purchases
- Inspection log
- Leaking equipment and repair log
- Control equipment monitoring log
- Keep for 5 years
- Keep design specs and operating manuals onsite

40 CFR 60 Subpart JJJ Petroleum NSPS

- Applicability
- Standards
- Monitoring
- Recordkeeping



Applicability

- Petroleum dry cleaning plants with total manufacturer's rated dryer capacity equal to or greater than 84 pounds

Standards

- All dryers shall be solvent recovery dryers
- Dryers shall be properly installed, operated and maintained

Standards

- Cartridge filters shall be drained for 8 hours prior to removal
- Manufacturers must provide leak inspection and repair procedures and recommend inspections every 15 days

Standards

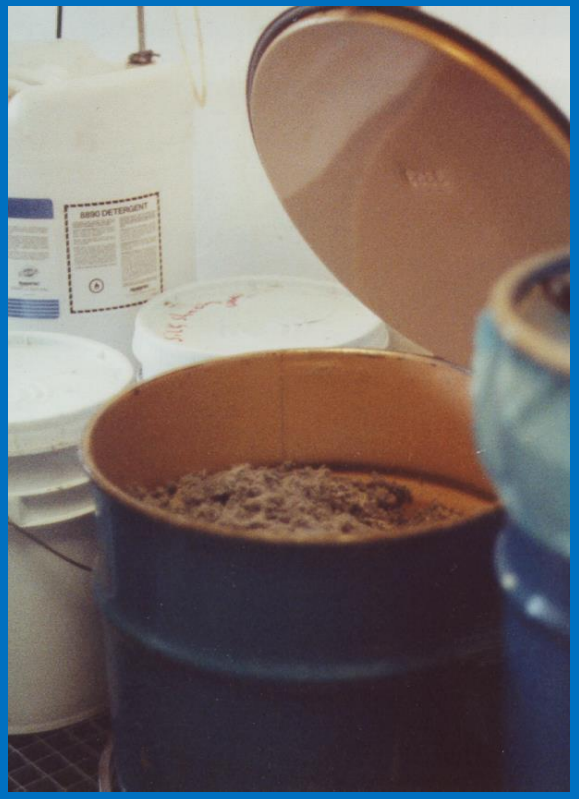
- Perform initial performance test to demonstrate that recovery rate of solvent at end of cycle is no greater than 0.05 liters per minute

Recordkeeping

- Keep record of initial performance test

Other Regulatory Requirements

- Transferring - Contaminated Waste
- Transferring Lint & Used Cartridges
- Storing Waste
- RCRA
- Wastewater



New Technologies

- Wet Cleaning
- Liquid CO_2
- Ultrasonic
- New Solvents

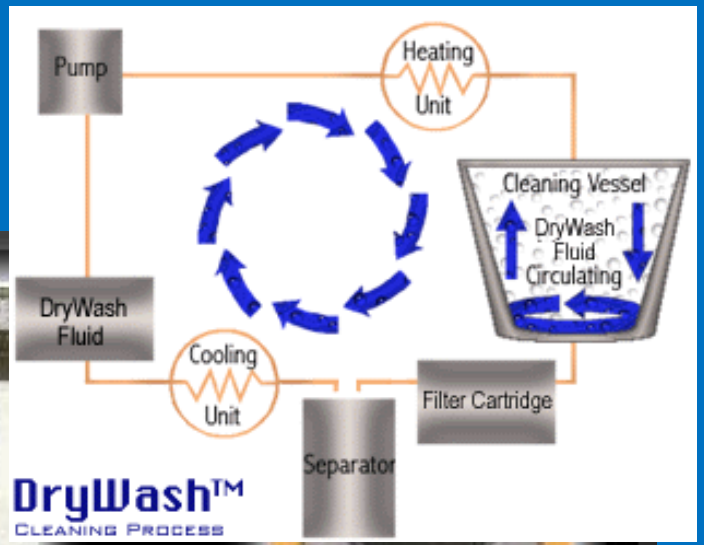
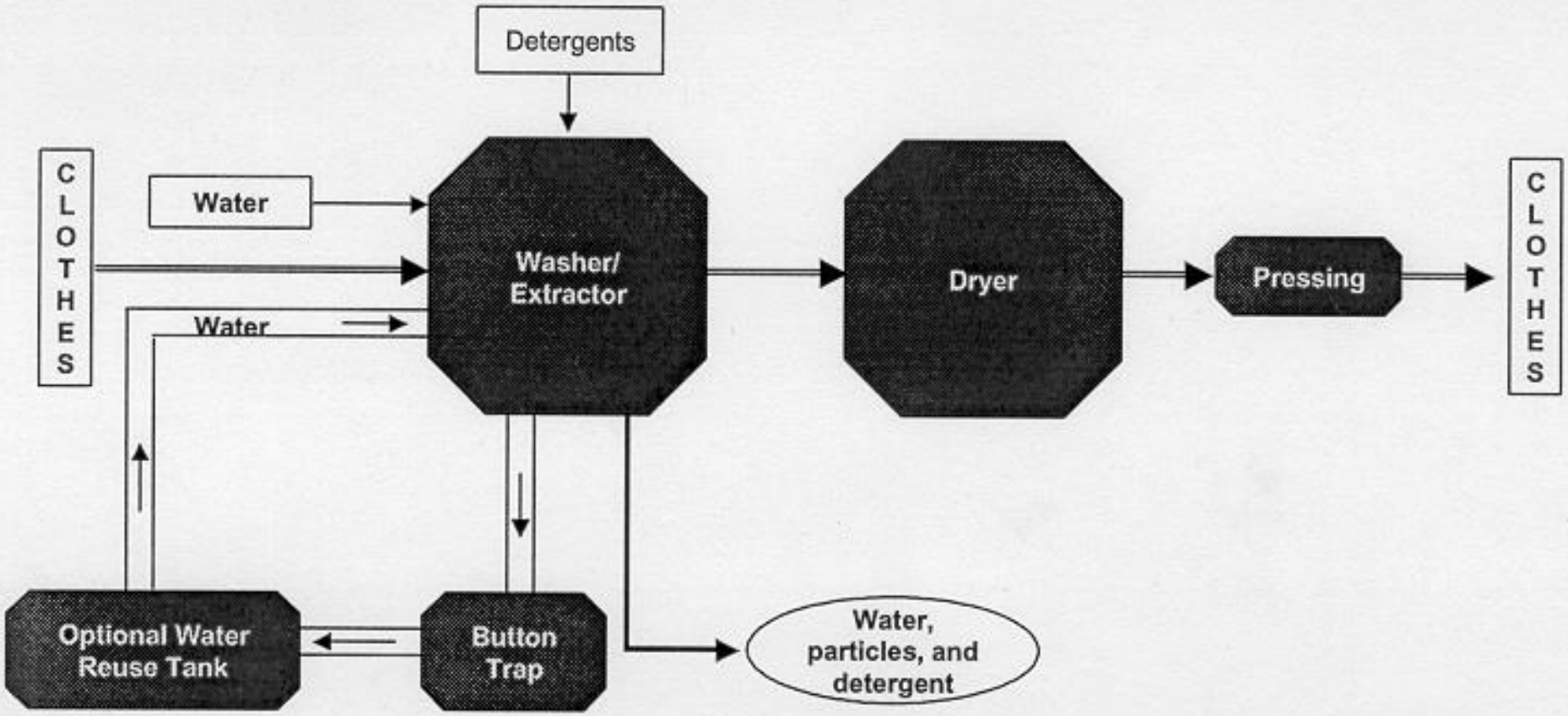


Exhibit 2-3. Simplified Process Flow Diagram for Machine Wetcleaning[a]



Liquid Carbon Dioxide

- LCO_2
- Jet Agitation
- High Pressure (1000 psi)

Ultrasonic Cleaning

- Aqueous Based
- Surfactants and Detergents
- Electrical Pulses Dislodges Insoluble Particles
- Temp. 90-122^{0}F
- Research Since 1993

Alternative Solvents

- Silicone-Based (Green Earth)
- Glycol Ether (Rynex) and others

Silicone-based Solvent

- Advantages:
  - Not Regulated as a Toxic, Non VOC
  - High Flash Point (170 F)
  - Safe For Delicate Garments
  - No Permitting Required

- Disadvantages:
  - Does Not Clean As Well As Perc
  - Problems With Water Separation
  - Requires A Modified Hydrocarbon Machine

Glycol Ether Solvent

- **Advantages:**
  - **Not Regulated as a Toxic**
  - **Excellent For Water Soluble Stain**
  - **High Flash Point (>200 F)**

- **Disadvantages:**
  - Standard D2D Machine Requires A $20,000 Conversion Kit
  - Does Not Clean All Garments Well

Other Alternative Solvents

- ExxonMobil DF-2000[1]: synthetic hydrocarbon, CAS 64742-48-9
- Chevron Philips EcoSolv®[1]: highly refined hydrocarbon, CAS 68551-17-7
- Sasol (LPA-142)[1]: highly refined hydrocarbon, CAS 64742-47-8
- SolvonK4™: dibutoxymethane, CAS 2568-90-3, by Kreussler
- DC-142[1]: aliphatic hydrocarbon solvent, CAS 64742-88-7, by Essential Solvents

Inspection of The Facility

- What Will the Inspector Have?
  - Permits and Inspection Forms
  - Complaint History
  - Safety Equipment
  - Monitoring Equip.

Inspector's Thoughts Entering Facility

- Do I Smell PERC?
- Is The Shop Clean?
- Is The PTO Visible?
- "Wall to Wall"
- Trained Operator Present?

The Inspection

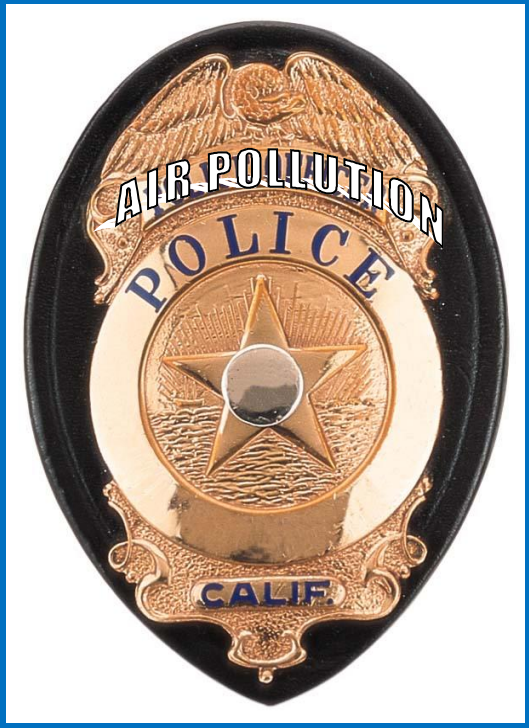
- Verify Equipment and Current Owners
- Conduct Leak Inspections
- Check For Closed Containers
- Verify Refrigerated Condenser Temp
- Check All Records
- Review The Inspection Results

What Records Should The Inspector Ask To See ?

- Operations & Maintenance Log
- Weekly Leak Inspection Log
- PERC Purchase Receipts
- Hazardous Waste Manifests
- Permit To Operate

What About Violations ?

- Notice Of Violation (NOV)
  - –Emissions Related
  - –Same Problem At Last Inspection



What About Violations ?

- Notice To Comply (NTC)
  - Minor Deficiency
  - Non-Emissions Related
  - Non-Recurring

Notice Of Violation

- Purchased Too Much PERC
- No Hydrocarbon Detector On-Site
- Missing Or Incomplete Records To Determine PERC Usage
- Open Container With PERC In It
- Same Violation As Last Inspection

Notice To Comply

- Incomplete Records
- Recently Expired Certificate
- Ownership Change Without Notifying The AQMD
- Some Records Missing
  (If Not Emissions Related)

Vapor Leak Inspections

- Definitions
- Halogenated Hydrocarbon Detector
- Areas To Check
- When To Check
- How Do You Do It?
- If a Leak is Found?

Vapor Leak Inspections

- Check Halogen Detector
- Tip Within 1 cm
- Slow & Direct
- Check All Openings & Gaskets
- Check Machine While Running

Summary of Components Most Likely to Leak

Component	Typical ppm	Leaks Found %	Reason for leak	Ranking
Loading Door	10-35	55%	Gasket	1st
Still	300	33%	Cover & Sight Glass	2nd
Lint Trap	120	25%	General & Gasket	3rd
Button Trap	20	14%	General & Gasket	4th
Water Separator	10	12%	Not Specified	5th
All Others	Varies	<5%	Not Specified	6th-14th


Vapor Leak Inspections

What Happens When a Leak Is Found?

- Fix Component
- Order Parts
- Installing Parts
- Extensions


Now, For The
Exam And The
Field Visit